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REPORT OF INVESTIGATIONS



PROPERTIES OF TYPICAL CRUDE OILS FROM
THE EAST TEXAS FIELD



BY

U.S. DEPOSITORY

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August, 1931.

REPORT OF INVESTIGATIONS

DEPARTMENT OF COMMERCE - BUREAU OF MINES

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PROPERTIES OF TYPICAL CRUDE OILS FROM
THE EAST TEXAS FIELD¹By E. L. Garton²

The United States Bureau of Mines has recently collected samples of crude petroleum from wells in the newly developed Joiner, Kilgore, and Longview fields of Rusk and Gregg Counties in the East Texas district, and from the Van field of the East Central district of Texas.

East Texas Crudes

The four samples of crude oil from the East Texas fields are all typical "intermediate base" crudes according to the classification given by Smith and Lane.³ Sample 31,063 is from the discovery well in the Joiner field. This well came in on October 3, 1930, with an initial production of 400 barrels per day. Sample 31,062 was obtained from a well that was completed on February 1, 1931, with an initial production of 3,500 barrels per day. The 32 East Texas crudes are produced at an average depth of approximately 3,600 feet, which is the deepest Woodgine-sand production so far encountered in any of the Texas or Louisiana fields.

All four samples have the same general characteristics. Each contains a small proportion of sulphur (average 0.28 per cent). The "total gasoline and naphtha," according to the United States Bureau of Mines method of interpretation of the analyses,³ averages 36.0 per cent, the kerosene distillate 9.6 per cent, the gas oil 15.1 per cent, the non-viscous lubricating distillate 9.7 per cent, and the medium lubricating distillate 6.2 per cent. The gas oil appears to be a good stock for the production of gasoline by cracking processes, and the lubricating distillates appear to be similar to distillates of the same ranges of viscosity obtained from Burbank, Okla., crude, which is generally recognized as a high-grade refining crude.

Crude from Van Field

Sample 31,061 from the Van field of Texas, differs in several respects from the East Texas crudes. The gravity (33.4° A.P.I.) is heavier, the sulphur content (0.89 per cent) is greater, and the "total gasoline and naphtha" fraction is only about two-thirds that of the East Texas crudes. Moreover, the crude is placed in the "paraffin base" class according to the United States Bureau of Mines method of analysis and interpretation.

¹ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used:
"Reprinted from U. S. Bureau of Mines Report of Investigations 3130."

² Junior chemical engineer, U. S. Bureau of Mines.

³ Smith, N. A. C., and Lane, E. C., Tabulated Analyses of Representative Crude Petroleum of the United States: Bull. 291, Bureau of Mines, 1928, 69 pp. Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., price 15 cents.

Table 1 contains some data showing the sources of the samples and some of the figures that indicate the physical and chemical properties of the crudes. Table 2 contains data upon which is based the classification of the crudes according to "base." The instructions given by Smith and Lane⁴ for the classification of crudes are as follows:

1. Note the A. P. I. gravity of the fraction distilling between 250° and 275°C. (482° and 527°F.) at atmospheric pressure. If this gravity is 40° A.P.I. or lighter, the oil can be considered definitely to have a paraffin base. If this gravity is 33° A.P.I. or heavier, the oil has either a naphthene or a hybrid base. If it is between 33 and 40, the oil has an intermediate base.

2. Note the "cloud point" of the fraction distilling between 275° and 300°C. (527° and 572°F.) at 40 mm. absolute pressure. If this cloud point is reported as being below 5°F., it indicates that wax is absent and that the oil has a naphthene base. If, however, the cloud point is above 5°F., it indicates the presence of wax and that the oil may have a paraffin, an intermediate, or a hybrid base.

The complete analyses of the five samples (31061-2-3-4-5) are given on pages 3 to 7, inclusive. These analyses were made by the United States Bureau of Mines Hempel method.⁵

Table 1.- Data showing sources of samples and some of the figures indicating physical and chemical properties

Sample No.	Field	Sand	Depth, feet	Properties of crude				Gasoline fraction		Viscosity at 100°F. of vacuum fractions			Carbon residue of
				°A.P.I.	S, per cent	Viscosity at 100°F.	Pour point	Per cent	°A.P.I.	225-250	250-275	275-300	residuums, per cent
31,062	S.W.Extn. Joiner	Woodbine	3638	39.4	0.30	40	45	37.1	60.8	60	85	150	7.7
31,063	Joiner	do.	3592	38.6	.28	40	25	35.8	60.2	55	81	130	6.6
31,064	Kilgore	do.	3652	40.0	.29	40	25	36.0	61.0	55	85	140	7.9
31,065	Longview	do.	3587	38.4	.26	41	30	35.0	59.5	55	80	130	6.7
31,061	Van	do.	2710	33.4	.29	56	(1)	24.6	61.0	62	93	175	10.0

(1) Below 5°F.

Table 2.- Data indicating the base of the crude oil

Sample No.	Field	Sand	Depth, feet	Fraction distilling at atmospheric pressure between 250-275°C.		Fraction distilling at 40 mm vacuum between 275-300°C.	Base of crude
				Specific gravity	°A.P.I.	Cloud point, °F.	
31,062	S.W.Extn. Joiner	Woodbine	3,638	0.835	38.0	95	Intermediate
31,063	Joiner	do.	3,592	.834	38.2	95	do.
31,064	Kilgore	do.	3,652	.835	39.0	95	do.
31,065	Longview	do.	3,587	.835	39.0	95	do.
31,061	Van	do.	2,712	.824	40.2	75	Paraffin base

4 See footnote 3.

5 Dean, E. W., Hill, H. H., Smith, N. A. C., and Jacobs, W. A., The Analytical Distillation of Petroleum: Bull. 207, Bureau of Mines, 1922, 82 pp. Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., price 15 cents.

Analyses of samples by Bureau of Mines Hempel method
SAMPLE 31061

J.T. Jarmine well 1	Van field	Texas
2,710 feet	Woodbine sand	Van Zandt County
Pure Oil Co.		

GENERAL CHARACTERISTICS

Specific gravity, 0.858	A.P.I. gravity, 33.4°
Per cent sulphur, 0.89	Pour point, below 5°F.
Saybolt Universal viscosity at 100°F., 56 sec.	Color, brownish black.

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation	Barometer 748 mm.	First drop: 29°C (84°F.)
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Temperature °C.	Per cent cut	Sum per cent	Sp. gr. of cut	°A.P.I. of cut	Viscosity 100°F.	Cloud test, °F.	Temperature °F.
Up to 50	0.9	0.9)					Up to 122
50 - 75	2.8	3.7)	0.692	73.0			122 - 167
75 - 100	2.1	5.8)					167 - 212
100 - 125	4.8	10.6	.721	64.8			212 - 257
125 - 150	5.1	15.7	.741	59.5			257 - 302
150 - 175	4.4	20.1	.758	55.2			302 - 347
175 - 200	4.5	24.6	.774	51.3			347 - 392
200 - 225	4.8	29.4	.789	47.8			392 - 437
225 - 250	4.8	34.2	.807	43.8			437 - 482
250 - 275	6.5	40.7	.824	40.2			482 - 527

Vacuum distillation at 40 mm.

Temperature °C.	Per cent cut	Sum per cent	Sp. gr.	°A.P.I.	Viscosity	Cloud test, °F.	Temperature °F.
Up to 200	4.1	4.1	.850	35.0	41	15	Up to 392
200 - 225	6.3	10.4	.850	32.8	48	30	392 - 437
225 - 250	5.9	16.3	.876	30.0	62	45	437 - 482
250 - 275	5.4	21.7	.891	27.3	93	60	482 - 527
275 - 300	6.5	28.2	.902	25.4	175	75	527 - 572

Carbon residue of residuum 10.0%.

Carbon residue of crude 3.1%.

APPROXIMATE SUMMARY

	Per cent	Sp. gr.	°A.P.I.	Viscosity
<u>Light gasoline</u>	<u>5.8</u>	<u>0.692</u>	<u>73.0</u>	
Total gasoline and naphtha	24.6	.735	61.0	
Kerosene distillate	16.1	.808	43.6	
Gas oil	8.2	.854	34.2	
Nonviscous lubricating distillate	11.4	0.863-0.892	32.5-27.1	50-100
Medium lubricating distillate	7.2	.892- .905	27.1-24.9	100-200
Viscous lubricating distillate	1.4	.905- .908	24.9-24.3	Above 200
Residuum	30.6	.965	15.1	
Distillation loss	0.5	-	-	

Analyses of samples by Bureau of Mines Hempel method--Continued

SAMPLE 31062

Calvin Young well 1	S. W. Extension, Joiner field	Texas
3,688 feet	Woodbine sand	Rusk County
Lide Taylor Oil Co.		

GENERAL CHARACTERISTICS

Specific gravity, 0.828	A.P.I. gravity, 39.4°
Per cent sulphur, 0.30	Pour point, 45°F.
Saybolt Universal viscosity at 100°F., 40 sec.	Color, greenish black

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation	Barometer, 743 mm.	First drop, 26°C. (79°F.)
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Temperature °C.	Per cent cut	Sum per cent	Sp. gr. of cut	°A.P.I. of cut	Viscosity 100°F.	Cloud test °F.	Temperature °F.
Up to 50	4.8	4.8	0.669	80.0			Up to 122
50 - 75	3.3	8.1	.670	79.7			122 - 167
75 - 100	6.4	14.5	.713	67.0			167 - 212
100 - 125	7.1	21.6	.741	59.5			212 - 257
125 - 150	5.7	27.3	.762	54.2			257 - 302
150 - 175	5.2	32.5	.781	49.7			302 - 347
175 - 200	4.6	37.1	.796	46.3			347 - 392
200 - 225	4.3	41.4	.810	43.2			392 - 437
225 - 250	4.9	46.3	.823	40.4			437 - 482
250 - 275	6.3	52.6	.835	38.0			482 - 527

Vacuum distillation at 40 mm.

Temperature °C.	Per cent cut	Sum per cent	Sp. gr. of cut	°A.P.I. of cut	Viscosity 100°F.	Cloud test °F.	Temperature °F.
Up to 200	4.4	4.4	.852	34.6	41	25	Up to 392
200 - 225	5.2	9.6	.860	33.0	48	45	392 - 437
225 - 250	4.5	14.1	.870	31.1	60	65	437 - 482
250 - 275	4.7	18.8	.878	29.7	85	80	482 - 527
275 - 300	5.9	24.7	.889	27.7	150	95	527 - 572

Carbon residue of residuum, 7.7%.

Carbon residue of crude, 1.7%.

APPROXIMATE SUMMARY

	Per cent	Sp. gr.	°A.P.I.	Viscosity
Light gasoline	14.5	0.689	73.9	
Total gasoline and naphtha	37.1	.736	60.8	-
Kerosene distillate	9.2	.817	41.7	-
Gas oil	14.2	.846	35.8	-
Nonviscous lubricating distillate	9.8	0.862-0.880	32.7-29.3	50-100
Medium lubricating distillate	7.0	.880- .895	29.3-26.6	100-200
Viscous lubricating distillate	-	-	-	Above 200
Residuum	22.0	.956	16.5	-
Distillation loss	0.7	-	-	-

Analyses of samples by Bureau of Mines Hempel method--Continued

SAMPLE 31063

Daisy Bradford well 3
3,536-3,592 feet
C. M. Joiner (E. R. Tennant)

Joiner field
Woodbine sand

Texas
Rusk County

GENERAL CHARACTERISTICS

Specific gravity, 0.832.

A.P.I. gravity, 38.6°

Per cent sulphur, 0.28

Pour point, 25°F.

Saybolt Universal viscosity at 100°F., 40 sec.

Color, greenish black

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation

Barometer 743 mm.

First drop, 27°C. (81°F.)

Temperature °C.	Per cent cut	Sum per cent	Sp. gr. of cut	°A.P.I. of cut	Viscosity 100°F.	Cloud test °F.	Temperature °F.
Up to 50	3.9	3.9	0.664	81.6			Up to 122
50 - 75	3.5	7.4	.674	78.4			122 - 167
75 - 100	5.8	13.2	.714	66.7			167 - 212
100 - 125	6.9	20.1	.741	59.5			212 - 257
125 - 150	6.0	26.1	.761	54.4			257 - 302
150 - 175	5.4	31.5	.781	49.7			302 - 347
175 - 200	4.3	35.8	.796	46.3			347 - 392
200 - 225	4.7	40.5	.810	43.2			392 - 437
225 - 250	5.0	45.5	.823	40.4			437 - 482
250 - 275	6.6	52.1	.834	38.2			482 - 527

Vacuum distillation at 40 mm.

Up to 200	4.0	4.0	.853	34.4	40	25	Up to 392
200 - 225	5.4	9.4	.859	33.2	47	45	392 - 437
225 - 250	5.2	14.6	.868	31.5	55	65	437 - 482
250 - 275	4.6	19.2	.878	29.7	81	80	482 - 527
275 - 300	5.3	24.5	.890	27.5	130	95	527 - 572

Carbon residue of residuum, 6.6%.

Carbon residue of crude, 1.5%.

APPROXIMATE SUMMARY

	Per cent	Sp. gr.	°A.P.I.	Viscosity
Light gasoline	13.2	0.689	73.9	
Total gasoline and naphtha	35.8	.738	60.2	-
Kerosene distillate	9.7	.817	41.7	-
Gas oil	15.4	.847	35.6	-
Nonviscous lubricating distillate	10.1	0.862-0.883	32.7-28.8	50-100
Medium lubricating distillate	5.6	.883- .896	28.8-26.4	100-200
Viscous lubricating distillate	-	-	-	Above 200
Residuum	23.0	.936	19.7	-
Distillation loss	0.4	-	-	-

Analyses of samples by Bureau of Mines Hempel method--Continued

SAMPLE 31064

L.D. Crim well 1	Kilgore field	Texas
3,640-3,652 feet	Woodbine sand	Rusk County
Humble Oil & Refining Co. (Bateman)		

GENERAL CHARACTERISTICS

Specific gravity, 0.825	A.P.I., gravity 40.0°
Per cent sulphur, 0.29	Pour point, 25°F.
Saybolt Universal viscosity at 100°F., 40 sec.	Color, greenish black

DISTILLATION, BUREAU OF MINES, HEMPEL METHOD

Dry distillation		Barometer 743 mm.		First drop, 28°C. (82°F.)			
Temperature °C.	Per cent cut	Sum, per cent	Sp. gr. of cut	°A.P.I. of cut	Viscosity 100°F.	Cloud test °F.	Temperature °F.
Up to 50	4.3	4.3	0.663	81.9			Up to 122
50 - 75	3.5	7.8	.664	81.6			122 - 167
75 - 100	6.0	13.8	.710	67.8			167 - 212
100 - 125	7.2	21.0	.741	59.5			212 - 257
125 - 150	5.8	26.8	.762	54.2			257 - 302
150 - 175	5.2	32.0	.782	49.5			302 - 347
175 - 200	4.0	36.0	.797	46.0			347 - 392
200 - 225	4.4	40.4	.810	43.2			392 - 437
225 - 250	4.7	45.1	.823	40.4			437 - 482
250 - 275	6.1	51.2	.835	38.0			482 - 527

Vacuum distillation at 40 mm.

Up to 200	4.2	4.2	.854	34.2	41	25	Up to 392
200 - 225	5.0	9.2	.859	33.2	45	45	392 - 437
225 - 250	4.8	14.0	.869	31.3	55	65	437 - 482
250 - 275	4.7	18.7	.878	29.7	85	80	482 - 527
275 - 300	5.5	24.2	.887	28.0	140	95	527 - 572

Carbon residue of residuum, 7.9%.

Carbon residue of crude, 1.8%.

APPROXIMATE SUMMARY

	Per cent	Sp. gr.	°A.P.I.	Viscosity
Light gasoline	13.8	0.684	75.4	
Total gasoline and naphtha	36.0	.735	61.0	
Kerosene distillate	9.1	.817	41.7	
Gas oil	15.3	.849	35.2	
Nonviscous lubricating distillate	8.6	0.864-0.880	32.3-29.3	50-100
Medium lubricating distillate	6.4	.880- .892	29.3-27.1	100-200
Viscous lubricating distillate	-	-	-	Above 200
Residuum	23.4	.958	16.2	
Distillation loss	1.2	-	-	

Analyses of samples by Bureau of Mines Hempel method--Continued

SAMPLE 31065

F.K. Lathrop well 1
3,587 feet
Arkansas Fuel Oil Co.

Longview field
Woodbine sand

Texas
Gregg County

GENERAL CHARACTERISTICS

Specific gravity, 0.833

A.P.I. gravity, 38.4°

Per cent sulphur, 0.26

Pour point, 30°F.

Saybolt Universal viscosity at 100°F., 41 sec.

Color, greenish black

DISTILLATION, BUREAU OF MINES, HEMPEL METHOD

Dry distillation

Barometer 743 mm.

First drop, 26°C. (79°F.)

Temperature °C.	Per cent cut	Sum per cent	Sp. gr. of cut	°A.P.I. of cut	Viscosity 100°F.	Cloud test °F.	Temperature °F.
Up to 50	2.3	2.3)					Up to 122
50 - 75	3.6	5.9)	0.672	79.1			122 - 167
75 - 100	6.4	12.3	.713	67.0			167 - 212
100 - 125	6.7	19.0	.741	59.5			212 - 257
125 - 150	5.9	24.9	.760	54.7			257 - 302
150 - 175	5.8	30.7	.781	49.7			302 - 347
175 - 200	4.3	35.0	.796	46.3			347 - 392
200 - 225	4.6	39.6	.809	43.4			392 - 437
225 - 250	5.7	45.3	.822	40.6			437 - 482
250 - 275	6.1	51.4	.835	38.0			482 - 527

Vacuum distillation at 40 mm.

Up to 200	3.9	3.9	.849	35.2	39	25	Up to 392
200 - 225	5.5	9.4	.853	34.4	45	40	392 - 437
225 - 250	5.8	15.2	.867	31.7	55	60	437 - 482
250 - 275	4.7	19.9	.876	30.0	80	80	482 - 527
275 - 300	5.7	25.6	.887	28.0	130	95	527 - 572

Carbon residue of residuum, 6.7%.

Carbon residue of crude, 1.5%.

APPROXIMATE SUMMARY

	Per cent	Sp. gr.	°A.P.I.	Viscosity
Light gasoline	12.3	0.693	72.7	
Total gasoline and naphtha	35.0	.741	59.5	
Kerosene distillate	10.3	.816	41.9	
Gas oil	15.6	.847	35.6	
Nonviscous lubricating distillate	10.2	0.860-0.882	33.0-29.3	50-100
Medium lubricating distillate	5.9	.882- .892	29.3-27.0	100-200
Viscous lubricating distillate	-	-	-	Above 200
Residuum	22.5	.955	16.7	
Distillation loss	0.5	-	-	

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